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TITLE: Lossless transform coding system having compatibility with lossy coding

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INVENTOR-INFORMATION:

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ABSTRACT:

A reversible eight-element discrete cosine transform coding system which provides transform values near to transform values of the original eight-element discrete cosine transform. In a 4.times.4 matrix transform which

appears when an eight-element discrete cosine transform is decomposed in accordance with a fast calculation method, transform coefficients (X1, X7, X3, X5) are separated into (X1, X7) and (X3, X5), which are quantized individually making use of the fact that, if (X1, X7) are determined, then values which can be taken by (X3, X5) are limited. (X1, X7) are quantized with step sizes k1, k7 by linear quantizers to obtain quantization values (Xq1, Xq7). Meanwhile, (X3, X5) are divided into global signals and local signals, and the global signals are quantized with step sizes L3, L5 by linear quantizers while quantization values of the local signals are determined using a table. The quantization values are added by adders to obtain quantization values (Xq3, Xq5) of (X3, X5). The reversible transform quantization for a 4.times.4 matrix and conventional reversible quantization of 2.times.2 matrices are combined to construct a reversible eight-element discrete cosine transform system.

12 Claims, 65 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 56

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Brief Summary Text - BSTX (6):
While the discrete cosine **transform** is useful for realization of high **compression** coding, since the base of the **transform**

is a real number, it is disadvantageous in that, in order to realize reversible coding, the quantization step size must be small, which results in deterioration of the coding efficiency.

Brief Summary Text - BSTX (43):

In order to attain the objects described above, according to a first aspect of the present invention, there is provided a reversible **transform** coding system which quantizes an original signal using a reversible **transformer** which effects reversible discrete cosine **transform** and wherein the reversible **transformer** reversibly **transforms** an integer four-element vector (u4, u5, u6, u7) of the original signal into quantization values (Xq1, Xq7, Xq3, Xq5), the reversible **transformer** including means for linearly **transforming** the integer four-element vector (u4, u5, u6, u7) with the 4.times.4 integer matrix of the expression (16) to obtain **transform** coefficients (X1, X7, X3, X5), means for linearly quantizing the **transform** coefficients X1, X7 with step sizes of natural numbers k1, k7 to obtain quantization values Xq1, Xq7 and quantization residuals r1, r7, respectively, means for determining representative elements (s3, s5) from a first numeric table using the **transform** coefficients (X1, X7) or the **transform** coefficients (X3, X5), means for subtracting the representative elements (s3, s5) from the **transform** coefficients (X3, X5) to calculate global signals (p3, p5), means for

linearly quantizing components p3, p5 of the global signals (p3, p5) with step sizes of **real numbers** L3, L5 to obtain global quantization values pq3, pq5, respectively, means for determining local quantization values (sq3, sq5) from the quantization residuals (r1, r7) based on a second numeric table, and means for adding the local quantization values (sq3, sq5) to the global quantization values (pq3, pq5) to obtain quantization values (Xq3, Xq5) and supplying the quantization values (Xq3, Xq5) as quantization values for the **transform** coefficients (X3, X5).

Brief Summary Text - BSTX (48):

The means for calculating global signal candidates (p3.sup.(.0.), p5.sup.(.0.)) from the quantization values (Xq3, Xq5) may include means for multiplying the quantization values Xq3, Xq5 by the **real numbers** L3, L5 to obtain quantization representative values (Xq3L3, Xq5L5), respectively, means for **transforming** the quantization representative values (Xq3L3, Xq5L5) with an inverse matrix to the matrix of the expression (19) represented using g, h which are given, from integers a1, a3, a5, a7, by g=a1.sup.2 -a7.sup.2 +2a3a5, h=a3.sup.2 -a5.sup.2 +2a1a7, respectively, to obtain inverse **transform** points (w3, w5), means for raising fractions of the inverse **transform** points w3, w5 to unit or discarding fractions of the inverse **transform** points w3, w5 to convert the inverse **transform** points w3, w5 into integers w3', w5', and means for **transforming** a vector (w3', w5') composed of the

integers w3', w5' with the
matrix of the expression (19) to obtain the global signal candidates
(p3.sup.(.0.), p5.sup.(.0.)).

Current US Cross Reference Classification - CCXR (1):

375/240.2